MJ16010, MJ16012
MJH16010,MJH16012

File Number **1839**

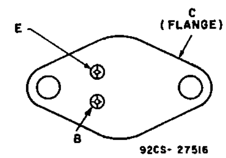
5-A SwitchMax II Power Transistors

High-Voltage N-P-N Types for Off-Line Power Supplies and Other High-Voltage Switching Applications

Features:
- *Fast switching speed*
- *High-voltage ratings:* *V_{CEV} = 850 V*
- *Low V_{CE}(sat) at I_c = 10A*

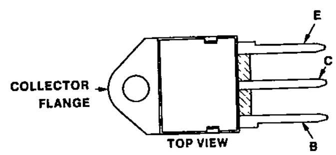
Applications:
- *Off-line power supplies*
- *High-voltage inverters*
- *Switching regulators*

TERMINAL DESIGNATIONS



MJ16010
MJ16012

JEDEC TO-204AA
(200 mil diameter pin isolation)



MJH16010
MJH16012

JEDEC TO-218AC

92CS-40257

The RCA MJ16010, MJ16012, MJH16010, and MJH16012 SwitchMax II series of silicon n-p-n power transistors feature high voltage capability, fast switching speeds, and low saturation voltages, together with high safe-operating-area (SOA) ratings. They are specially designed for off-line power supplies, converter circuits, and pulse-width-modulated regulators. These high-voltage, high-speed transistors are tested for parameters that are essential to the design of high-power switching circuits. Switching times, including inductive turn-off time, and saturation voltages are specified at 100°C to provide information necessary for worst-case design.

The MJ16010 and MJ16012 transistors are supplied in steel JEDEC TO-204AA hermetic packages. The MJH16010 and MJH16012 transistors are supplied in JEDEC TO-218AC plastic packages.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

<table>
<tr><th></th><th>MJ16010
MJ16012</th><th>MJH16010
MJH16012</th><th></th></tr>
<tr><td>V_{CEV}
V_{BE} = −1.5 V</td><td colspan="2">850</td><td>V</td></tr>
<tr><td>V_{CEO}</td><td colspan="2">450</td><td>V</td></tr>
<tr><td>V_{EBO}</td><td colspan="2">6</td><td>V</td></tr>
<tr><td>I_C(sat)</td><td colspan="2">10</td><td>A</td></tr>
<tr><td>I_C</td><td colspan="2">15</td><td>A</td></tr>
<tr><td>I_{CM}</td><td colspan="2">20</td><td>A</td></tr>
<tr><td>I_B</td><td colspan="2">10</td><td>A</td></tr>
<tr><td>I_{BM}</td><td colspan="2">15</td><td>A</td></tr>
<tr><td>P_T
@ T_C = 25°C</td><td>175</td><td>135</td><td>W</td></tr>
<tr><td>@ T_C = 100°C</td><td>100</td><td>53.8</td><td>W</td></tr>
<tr><td>T_C above 25°C, derate linearly</td><td>1</td><td>1.08</td><td>W/°C</td></tr>
<tr><td>T_{stg} T_J</td><td>-65 to 200</td><td>-65 to 150</td><td>°C</td></tr>
<tr><td>TL
At distance ≥ 1/8" in. (3.17 mm) from seating plane for 10 s max</td><td></td><td>235</td><td>°C</td></tr>
<tr><td>T_L
At distance ≥ 1/16" in. (1.58 mm) from seating plane for 10 s max.</td><td>235</td><td></td><td>°C</td></tr>
<tr><td>$R_{\theta JC}$</td><td>1</td><td>0.93</td><td>°C/W</td></tr>
</table>

MJ16010, MJ16012, MJH16010, MJH16012

MJ16010, MJH16010

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (1)					
Collector-Emitter Sustaining Voltage (I_C = 100 mA, I_B = 0)	$V_{CEO(sus)}$	450	—	—	Vdc
Collector Cutoff Current	I_{CEV}				mAdc
(V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc)		—	—	0.25	
(V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)		—	—	1.5	
Collector Cutoff Current (V_{CE} = 850 Vdc, R_{BE} = 50 Ω, T_C = 100°C)	I_{CER}	—	—	2.5	mAdc
Emitter Cutoff Current (V_{EB} = 6.0 Vdc, I_C = 0)	I_{EBO}	—	—	1.0	mAdc
SECOND BREAKDOWN					
Second Breakdown Collector Current with Base Forward Biased	$I_{S/b}$	See Figure 1			
Clamped Inductive SOA with Base Reverse Biased	RBSOA	See Figure 2			
ON CHARACTERISTICS (1)					
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$				Vdc
(I_C = 5.0 Adc, I_B = 0.7 Adc)		—	0.5	2.5	
(I_C = 10 Adc, I_B = 1.3 Adc)		—	1.0	3.0	
(I_C = 10 Adc, I_B = 1.3 Adc, T_C = 100°C)		—	—	3.0	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$				Vdc
(I_C = 10 Adc, I_B = 1.3 Adc)		—	1.0	1.5	
(I_C = 10 Adc, I_B = 1.3 Adc, T_C = 100°C)		—	—	1.5	
DC Current Gain (I_C = 15 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	5.0	—	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1 0 kHz)	C_{ob}	—	—	400	pF

SWITCHING CHARACTERISTICS

Characteristic	Conditions		Symbol	Min	Typ	Max	Unit
Resistive Load							
Delay Time	(I_C = 10 Adc, V_{CC} = 250 Vdc, I_{B1} = 1.3 Adc, PW = 30 μs, Duty Cycle ≤2.0%)	(I_{B2} = 2.6 Adc, R_B = 1.6 Ω)	t_d	—	40	—	ns
Rise Time			t_r	—	100	—	
Storage Time			t_s	—	1400	—	
Fall Time			t_f	—	140	—	
Storage Time		($V_{BE(off)}$ = 5.0 Vdc)	t_s	—	600	—	
Fall Time			t_f	—	100	—	
Inductive Load							
Storage Time	(I_C = 10 Adc, I_{B1} = 1 3 Adc, $V_{BE(off)}$ = 5 0 Vdc, $V_{CE(pk)}$ = 400 Vdc)	(T_C = 100°C)	t_{sv}	—	800	1800	ns
Fall Time			t_{fi}	—	50	200	
Crossover Time			t_c	—	100	250	
Storage Time		(T_C = 150°C)	t_{sv}	—	860	—	
Fall Time			t_{fi}	—	40	—	
Crossover Time			t_c	—	80	—	

(1) Pulse Test Pulse Width = 300 μs, Duty Cycle ≤ 2 0%

MJ16010, MJ16012, MJH16010, MJH16012

MJ16012, MJH16012

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic			Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (1)							
Collector-Emitter Sustaining Voltage (I_C = 100 mA, I_B = 0)			$V_{CEO(sus)}$	450	—	—	Vdc
Collector Cutoff Current (V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc)			I_{CEV}	—	—	0.25	mAdc
(V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)				—	—	1.5	
Collector Cutoff Current (V_{CE} = 850 Vdc, R_{BE} = 50 Ω, T_C = 100°C)			I_{CER}	—	—	2.5	mAdc
Emitter Cutoff Current (V_{EB} = 6.0 Vdc, I_C = 0)			I_{EBO}	—	—	1.0	mAdc
SECOND BREAKDOWN							
Second Breakdown Collector Current with Base Forward Biased			$I_{S/b}$	See Figure 1			
Clamped Inductive SOA with Base Reverse Biased			RBSOA	See Figure 2			
ON CHARACTERISTICS (1)							
Collector-Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 0.5 Adc)			$V_{CE(sat)}$	—	—	2.5	Vdc
(I_C = 10 Adc, I_B = 1 0 Adc)				—	—	3.0	
(I_C = 10 Adc, I_B = 1.0 Adc, T_C = 100°C)				—	—	3.0	
Base-Emitter Saturation Voltage (I_C = 10 Adc, I_B = 1.0 Adc)			$V_{BE(sat)}$	—	—	1.5	Vdc
(I_C = 10 Adc, I_B = 1.0 Adc, T_C = 100°C)				—	—	1.5	
DC Current Gain (I_C = 15 Adc, V_{CE} = 5.0 Vdc)			h_{FE}	7.0	—	—	—
DYNAMIC CHARACTERISTICS							
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1.0 kHz)			C_{ob}	—	—	400	pF
SWITCHING CHARACTERISTICS							
Resistive Load							
Delay Time	(I_C = 10 Adc, V_{CC} = 250 Vdc, I_{B1} = 1.0 Adc, PW = 30 μs, Duty Cycle ≤2.0%)	(I_{B2} = 2.0 Adc, R_B = 1.6 Ω)	t_d	—	40	—	ns
Rise Time			t_r	—	100	—	
Storage Time			t_s	—	1400	—	
Fall Time			t_f	—	140	—	
Storage Time		($V_{BE(off)}$ = 5 0 Vdc)	t_s	—	600	—	
Fall Time			t_f	—	100	—	
Inductive Load							
Storage Time	(I_C = 10 Adc, I_{B1} = 1.0 Adc, $V_{BE(off)}$ = 5.0 Vdc, $V_{CE(pk)}$ = 400 Vdc)	(T_C = 100°C)	t_{sv}	—	800	1500	ns
Fall Time			t_{fi}	—	50	150	
Crossover Time			t_c	—	100	200	
Storage Time		(T_C = 150°C)	t_{sv}	—	860	—	
Fall Time			t_{fi}	—	40	—	
Crossover Time			t_c	—	80	—	

(1) Pulse Test· Pulse Width = 300 μs, Duty Cycle ≤ 2 0%

MJ16010, MJ16012, MJH16010, MJH16012

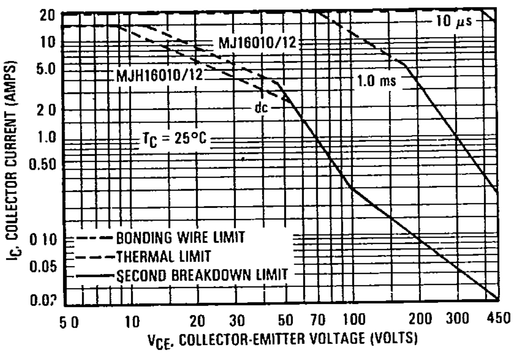


Fig. 1 — Maximum forward-bias safe-operating-areas for all types.

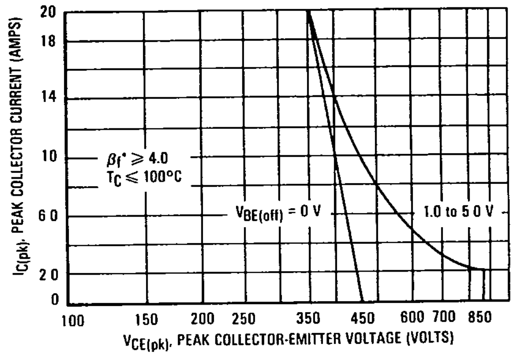


Fig. 2 — Maximum reverse-bias safe-operating-areas for all types.

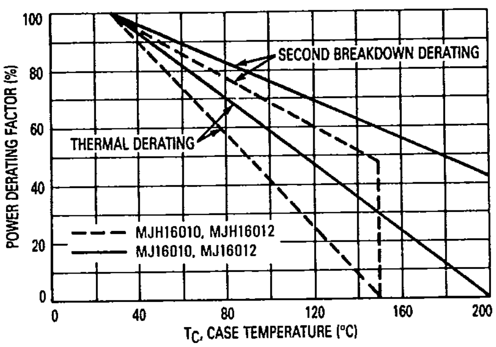


Fig. 3 — Dissipation and $I_{s\,b}$ derating curves for all types.

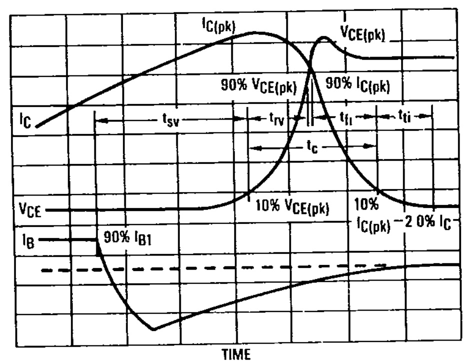


Fig. 4 — Inductive switching measurements display.